WRITTEN STATEMENT SUBMITTED TO THE STRATEGIC FORCES SUBCOMMITTEE OF THE SENATE ARMED SERVICES COMMITTEE

LOS ALAMOS NATIONAL LABORATORY
DIRECTOR JOHN C. BROWNE
April 10, 2002

Thank you Mr. Chairman and distinguished members of the Strategic Forces Subcommittee for the opportunity to submit this report on the status of the national security programs at Los Alamos National Laboratory. Los Alamos is one of three multi-program scientific institutions supported by the Department of Energy's National Nuclear Security Administration (NNSA), and has been operated by the University of California since its inception in 1943. Seventy percent of the work at Los Alamos supports the NNSA mission. Eighty percent of our work is directly related to national security. All of our work stems from our historic public service and national security mission. We appreciate the support this Subcommittee has given us in carrying out our mission.

The new threats of the 21st century—worldwide terrorism and the daunting possibility of the use of weapons of mass destruction—cannot be met by nuclear deterrence alone. With the formation of the Office of Homeland Security and the issuance of the Nuclear Posture Review and the Quadrennial Defense Review, our country is developing new national security policy directions for the 21st century that will require a broad array of scientific and technological innovations in the coming decades. The NNSA weapons laboratories will provide the nation with many of the needed science and technology capabilities that will support our nation's needs in nuclear deterrence, conventional defense and homeland security.

Our stockpile stewardship mission is directly linked to the urgent national security priorities of our country. We are aligned with the new nuclear strategy set forth in the 2001 Nuclear Posture Review (NPR) which outlines a deterrence strategy based on a new triad of non-nuclear and nuclear strike capabilities, a strong defense capability, and a responsive defense infrastructure. The active support of the new triad by healthy and responsive national laboratories, as well as the DoD, will be key to the success of this deterrence strategy. We are committed to:

- Ensuring the safety, reliability and responsiveness of the US nuclear-weapon stockpile;
- Reducing threats to US and global security, with a special focus on countering proliferation and possible terrorist acquisition, threats and use of weapons of mass destruction; and,
- Providing technical solutions to long-term national security problems in infrastructure vulnerabilities, energy, environment, and health.

We are as focused and committed today to our mission and purpose as we were 60 years ago. The stockpile stewardship mission—maintaining the safety and reliability of the enduring nuclear stockpile without nuclear testing—is one of the most difficult technical

challenges this nation has ever attempted. As our nuclear weapons age beyond their design lifetimes, Directed Stockpile Work—surveillance, assessment, and response—will increase. Certification of nuclear weapons in an environment without nuclear testing requires the best science in modeling and simulation, dynamic material behavior, special nuclear materials and explosives, and experimentation. Therefore, our weapons activities must focus on ensuring a balanced and sustainable stewardship—between direct stockpile work and the campaigns that support the underlying science needed to certify stockpiled weapons and to meet future nuclear weapon requirements —for this decade and beyond.

To meet the technical and operational challenges posed by our demanding mission, last September I appointed a new nuclear-weapon program management team and restructured the Laboratory to be more focused on execution and product delivery. There are several structural changes in the NNSA being implemented in the field and site offices. These changes should strengthen our partnership with the NNSA, at all levels, which already has markedly improved under General Gordon's tenure. The University of California (UC) has appointed a new Vice President for Laboratory Management and has increased its oversight and involvement in improving Laboratory performance and operations. We are operating under a new five-year contract between UC and DOE/NNSA that requires us to perform against rigorous technical and operational standards that will serve the nation well.

We have made great progress during this past year. I will highlight some major accomplishments in our stockpile stewardship program, our threat reduction program, and in our operations. I will also review key issues and challenges with respect to our mission that face us in the future--and to the science, the workforce and the infrastructure that underpin that mission. In the attached addendum, key elements of our nuclear weapon and threat reduction programs are addressed in greater detail.

PROGRESS AND ACCOMPLISHMENTS: HIGHLIGHTS

I. Stockpile Stewardship Program

In 1995, we were tasked to conduct a stockpile stewardship effort to sustain the enduring nuclear-weapon stockpile without nuclear testing. Sustaining the nuclear deterrent under these conditions continues to pose a grand challenge. It is my primary responsibility to position the Laboratory and provide the people and tools to ensure that we are equal to this challenge. The requirements of stockpile stewardship are technical, determined by the science of nuclear weapons, by the processes of aging affecting both the workforce and the weapons, and by required levels of confidence. It is essential that we meet these requirements. I would like to highlight a few of our achievements in meeting these requirements.

Annual Certification

For the sixth consecutive year, I have been able to certify to the Secretaries of Defense and Energy that the five Los Alamos designed weapons (B61 family, W76, W78, W80, and W88) in the US nuclear stockpile remain safe and reliable and that a nuclear test is not required at this time to resolve any of the issues that

exist for these weapons. Although I am concerned about a growing number of issues identified by our ongoing surveillance activities, to date we have been able to resolve most of the issues through assessments, changes in operating conditions, or refurbishment plans. In the past some of these issues would have required nuclear tests to resolve. The challenge we face is to have certification tools and trained people adequate to address these issues.

We have strengthened our certification approach each year since beginning this process in 1996. In the past year, Los Alamos and Lawrence Livermore National Laboratories reached agreement on an approach for certification that utilizes similar methodologies while maintaining independence for peer review purposes. In addition, we are planning to phase in internal "red teams" or "fresh-eye teams" at Los Alamos designed to look for the issues that might have been overlooked by the responsible warhead design/refurbishment team. Reports from both teams will be submitted to me for incorporation into my annual assessment of the stockpile.

Pit Manufacturing and Certification

One of our highest priorities at Los Alamos National Laboratory is to re-establish the nation's capability to manufacture plutonium pits, the heart of nuclear weapons. The W88 has been selected as the crucial prototype for restoring the nation's nuclear manufacturing capability. Producing a pit for a nuclear weapon involves two distinct but intertwined activities: manufacturing and certification. Significant progress in this program has been made in this last year. We are well along in establishing a limited manufacturing capacity for pits. Eleven developmental units have been produced to date. We are on schedule to deliver a certifiable W88 pit, defined as one that meets all manufacturing requirements and specifications, by April 2003.

Even though we will provide a key capability in a timely fashion, the Laboratory will not have sufficient capacity to meet envisioned future pit production requirements. We support NNSA's pit production strategy, which is based on an assessment of pit lifetime and numbers of weapons projected in the stockpile, to reestablish industrial-scale pit production in the longer term.

Certification of the pit is an extremely challenging process that requires both highly specialized equipment and expertise. Los Alamos has identified a series of laboratory and sub-critical experiments that are designed to test and validate our computer simulations that will be needed to ensure that the pit will perform as designed. Based on improved planning and better certification methodology we have been able to move up our schedule for certifying these pits for war reserve use from the previously scheduled date of 2009 to 2007.

Directed Stockpile Work

In addition to our pit manufacturing responsibilities, we are also responsible for Neutron Target Tube Loading, detonator fabrication for all the weapons in the

stockpile, Beryllium component manufacturing, pit and valve surveillance testing, and high fidelity mock pits for Joint Test Assemblies (JTA) used in flight testing.

In the area of stockpile Life Extension Programs (LEPs), we began engineering development for the Navy's W76 warhead and will proceed toward production development and certification with the first production unit (FPU) scheduled for 2007. Evaluation of the condition and life expectancy of the materials in the nuclear explosive package is being addressed. A major refurbishment is planned to support the extension of the lifetime of this warhead to 2042. We also have finalized plans with NNSA, Pantex, and Y-12 to begin refurbishing canned subassemblies of the B61 Mod 7 and 11 in 2006. In support of the Livermore National Laboratory W80 Life Extension Program, we are developing the Acorn gas transfer system with the Sandia—California site. With Sandia, we have completed the W80 Baseline program and continue to support knowledge transfer to LLNL.

As part of the Enhanced Surveillance program, Los Alamos continues to be a national leader in materials characterization and aging studies. We are developing non-destructive technologies for surveillance and diagnostics on components and systems that will help us improve our understanding of nuclear weapons aging.

Advanced Simulation and Computing

The Advanced Simulation and Computing (ASC) program of the NNSA is an essential element of the nuclear-weapons program. The objective is to provide greater computing power and to develop new computational models that will allow weapons designers and other nuclear weapons experts to use validated modeling and simulation to assess changes in the stockpile to determine if the existing weapons remain safe and reliable without nuclear testing.

We continue to make rapid advances in the ability to simulate nuclear explosions faster and with greatly increased detail. During this past year, we completed the first three-dimensional simulation of a full nuclear weapon system explosion using the LLNL 12 Teraops White computer. This calculation represents the first time that we have been able to compute a fully-coupled primary and secondary explosion to analyze weapon performance. It represents a breakthrough for the program and unprecedented detail for designers and analysts.

The Strategic Computing Complex (SCC) was completed on schedule and under budget. We are installing the first phase of 10 TeraOps of the 30 TeraOps computer that was purchased for this ASC program. We are installing the full capability in "phases" in order to facilitate performance testing to connectivity requirements. The computer will provide the computing power required to run the new computational tools to support the Stockpile Stewardship Program mission. These new weapon-system simulations will replace the less-predictive legacy based models.

Hydrodynamic Testing

The nuclear weapon primary is the most critical component of the weapon. Understanding its performance is essential to confidence in the safety and reliability of the stockpile. Hydrodynamic tests of primary systems—non-yield experiments measuring the implosion characteristics of primary systems using simulated nuclear materials—enable us to evaluate some crucial aspects of nuclear weapon performance. Completion of the first axis of the Dual Axis-Radiographic Hydro-Test (DARHT) facility has enabled us to perform these tests with outstanding spatial resolution of the imploding surrogate pit. We performed five major hydro tests (four at DARHT) in the last quarter of FY01 directly related to stockpile systems and in support of certification activities and plan six more later this year. Following commissioning and optimization of the second axis of DARHT, the facility will provide an enhanced diagnostic capability in FY04. We are also continuing to develop proton radiography as an advanced capability in order to maintain our ability to certify the refurbished nuclear weapons, and to validate the predictive capabilities of next-generation designers.

Test Readiness

The Nuclear Posture Review has called for enhanced test readiness. We support test readiness through a number of collaborations with the Nevada Test Site. The most prominent collaboration is that of sub-critical, non-yield, underground tests that address key dynamic materials issues and exercise the infrastructure required should a return to underground nuclear testing be needed. In February, we conducted a successful collaborative sub-critical experiment in Nevada that yielded significant data. Although we see no reason to do a nuclear test today, we support General Gordon's direction to reduce the timescale required to resume nuclear testing as a prudent measure.

Advanced Concepts

The Nuclear Posture Review identified a need for the nuclear-weapons design laboratories to maintain their design expertise through the study of advanced concepts that could meet changing weapon requirements in the future. These studies include new and extended concepts (those that may have been developed and tested in the past, but not deployed). At Los Alamos, we have an NNSA-approved effort evaluating robust earth-penetrating weapons and a small study group looking at past R&D efforts that could be developed to meet changing national needs for nuclear deterrence. If the country requires a vigorous effort, we will need explicit support and funding for such advanced concepts.

II. Threat Reduction Program: Non-proliferation, counter terrorism, homeland security, and defense transformation

As a result of shifting national security priorities since September 11, the newly created Office of Homeland Security has been charged with protecting the United States from terrorist attack. We are strongly committed to supporting this effort and are participating

with Lawrence Livermore and Sandia National Laboratories in an effort to defend the U.S. against nuclear, chemical and biological terrorist attacks.

For example, our pioneering work on sequencing the Human Genome helped not only to develop technologies and breakthroughs, but also to grow a unique bioscience base at the Laboratory. Because we had developed this capability, in the aftermath of September 11 we were able to play a key role in analyzing DNA of anthrax samples from the mail attacks. We were able to determine that these samples came from the common Ames strain, which assisted in efforts to respond to and treat victims. With Livermore, we deployed a biological agent detection system at the Salt Lake City Olympics. The Multi-spectral Thermal Imager (MTI) satellite, developed in a joint project with Sandia National Laboratories, was re-deployed to help analyze the destruction and the dispersal of potentially harmful debris from the attacks on the World Trade Center.

We currently are working with Sandia to develop a critical infrastructure analysis capability, which derives from an innovative simulation and modeling approach originally developed for understanding and improving large-scale transportation networks. The National Infrastructure Simulation and Analysis Center (NISAC) will use this approach for government planning and analysis of vulnerabilities and responses to terrorist attacks.

We have provided the nation with our expertise and special equipment for over 25 years in addressing threats of stolen or improvised nuclear devices through our NEST teams that continue to serve today. We also have been working since the early 90's to help secure vulnerable nuclear materials in Russia, and have supplied technologies for decades to help the International Atomic Energy Agency and other governments control nuclear materials.

III. Laboratory Operations

During the past year, we rigorously continued our efforts to integrate safety and security into our programmatic work. We have fortified our physical and cyber security, and have increased security still further since September 11. Our guard force is over 500 with a large contingent of SWAT teams; our defense against a terrorist attack has been significantly enhanced; our special nuclear materials are in a safe and secure configuration. Because of the rapid pace of change in technology, maintaining an appropriate level of support for cyber security will be critical to our ability to meet the challenges presented by this continuing threat.

Laboratory safety performance has markedly improved compared to national benchmarks—total recordable incidents have decreased over the past four years from over 4.0 per 200,000 hours worked to less than 2.0 this year. In the same time frame, lost workday cases have decreased from over 3.2 per 200,000 hours worked to 0.90. Waste generation and radiation exposures have all been significantly reduced, and we have moved some of our transuranic waste off site from Area G to WIPP, although I believe that the DOE could increase the priority to ship more waste.

Project management improvements at Los Alamos continue to build on a strong foundation we established three years ago. We presently have three (3) major construction projects that either have finished or will finish significantly ahead of schedule and under budget.

MAJOR CHALLENGES: ENSURING THE FUTURE

I. Science: Achieving Program Balance

The biggest challenge facing the Stockpile Stewardship Program is developing a balanced program within the budgets provided by the Congress. The balance that must be struck is between warhead life extension programs, infrastructure maintenance and recapitalization, sustaining a preeminent capability in weapons-relevant science and experimentation, test readiness, and exploration of advanced concepts. The Future Years National Security Plan (FYNSP) that NNSA submitted to Congress this year is a good start toward providing a process for achieving this balance. At present, scientific investments needed to ensure that the next generation of weapons designers will be able to certify the stockpile in future decades are under stress due to the focus on the refurbishment of three weapons systems in the coming decade. The predictive assessment tools currently available to certify these planned LEPs are not yet adequate for the scope of these refurbishments. The addition of new production facilities, such as the modern pit facility, will add to that stress unless the future year budgets accommodate such large expenditures.

II. Threat Reduction

NNSA, working with LANL and the other NNSA laboratories, has had many successes with the existing Chemical and Biological National Security Program (CBNP), but the important research in this area needs to be expanded to include a broader range of biological threats. On the nuclear side of the equation, however, no CBNP-like program currently exists. Because of the threat posted by nuclear and radiological terrorism, we believe that creation of a broad-based nuclear threat program is critical to meeting the challenges in this area. A new program within NNSA could be modeled upon the already successful CBNP program. Lastly, in order to tie all of these activities together, I believe that NNSA should take on a major responsibility for homeland security research and development.

III. Workforce

A large number of personnel at Los Alamos are nearing retirement, and it is critical that we effect the transfer of technical and programmatic knowledge that they embody. We must attract and retain the next generation of stockpile stewards. We are planning to hire approximately 1000 employees during FY02—600 to meet workload requirements and 400 to address attrition. We are aggressively recruiting, and are strategically focusing these hiring efforts to attract 80% of new hires at the entry-level. To date, this fiscal year we have hired over 300 new employees. To attract the most outstanding scientists, engineers, technicians, and support personnel we must focus our efforts on sustaining and improving the quality of life for our employees. We must redouble our efforts in areas

that impact our ability to attract and retain a diverse and high quality workforce—by ensuring that we retain our ability to pursue cutting edge science and research, by improving our infrastructure and facilities, and through a continued focus on and investment in education, the environment, and economic development.

Laboratory Directed Research and Development (LDRD) is a key tool that I have available to help attract and retain the best scientists and engineers. LDRD is a well-managed program as indicated by a recent GAO audit of the program. I strongly recommend that Congress continue its strong support for LDRD. Continued support of the Los Alamos schools and Los Alamos National Laboratory Foundation also is key to employee recruiting and retention, as well as to education and economic development in the region.

IV. Infrastructure

We continue to experience deterioration of our infrastructure and facilities, which may serve to undermine our long-term ability to fulfill stockpile stewardship objectives. We have developed a Ten Year Comprehensive Site Plan that NNSA has approved as a guide for prioritizing maintenance and facility replacement at our site. In addition, I have chartered an external review of our facilities and infrastructure to determine where and how we might shrink our footprint for today's mission.

In particular, we need your support for the replacement of our 50-year-old Chemistry and Metallurgy Research (CMR) building, which is planned for relocation within an Integrated Nuclear Complex at our TA-55 site. We strongly support General Gordon's 10-year Facilities and Infrastructure Revitalization Initiative. Congress provided an initial appropriation last year ($200M), but this will continue to be a critical issue in FY03 and the out years. Without your continuing and strong support of this initiative, we will not be able to carry out either the manufacturing or certification efforts for the stockpile.

CONCLUSION

For more than a half a century, the nation's investments in Los Alamos have helped ensure our national security. We face ongoing and new challenges— a new Nuclear Posture with fewer deployed nuclear weapons, certification of an aging stockpile without nuclear testing; the need for a balanced program ensuring science in our programmatic endeavors; and the need for new technologies to address non-proliferation, threat reduction and counter-terrorism. We are committed to meeting these challenges to our nation's security.

In conclusion, I would like to thank you for your past support. Your continued support is critical to our ability to meet the technically demanding and vital national security challenges we face today and in the future.

ADDENDUM TO THE

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**LOS ALAMOS NATIONAL LABORATORY
DIRECTOR JOHN C. BROWNE
April 10, 2002**

The following information supplements the Laboratory Report submitted by Director John C. Browne of Los Alamos National Laboratory (LANL).

Stockpile Stewardship

The purpose of the National Nuclear Security Administration's (NNSA) Stockpile Stewardship Program (SSP) is to maintain high confidence in the continued safety and reliability of the Nation's nuclear weapons arsenal without returning to underground nuclear testing. SSP consists of several integrated sets of activities: surveillance, life extension, manufacturing, design capability, infrastructure revitalization, workforce regeneration, and certification. Each of these depends on and contributes to the others and success requires that there be a reasonable balance among and between them – suggestions that the SSP should be skewed to place significantly more emphasis on one over the others put the overall success of SSP at risk.

As the gap between the time when the last nuclear test was conducted and the date of each annual certification grows, our ability to successfully execute the Stockpile Stewardship mission becomes more difficult. We will not be able to do the job if we do not reverse the aging of our infrastructure or the aging of our workforce. Nor can we expect success if we do not systematically improve the scientific and technical tools and machines that allow weapons technical experts to advance their understanding through experimentation, computation, and simulation. These issues are discussed in greater detail below.

Surveillance

Surveillance occurs year-round on all weapons systems in the active stockpile, including the five systems for which Los Alamos is responsible: B61, W76, W78, W80, and W88. Its purpose is to identify indicators of existing, or impending, conditions that could impact safety, reliability, or performance, with the goal of developing a predictive capability. This is accomplished by using a suite of tests, including:

- Functional testing of selected components;
- Destructive analysis of components to identify defects or failures in individual nuclear and non-nuclear parts;
- Flight testing of warheads in which nuclear material has been removed and replaced with precision instrument packages that match the critical features of weight and moment of inertia; and
- Nondestructive evaluation of selected components.

Results of these tests are combined with data collected over the life of each weapon system for analysis by nuclear weapons experts who use expert judgment to determine impacts. Defects from aging, design or production that are revealed through surveillance activities are formally addressed via "significant finding investigations" (SFI).

Significant Finding Investigations

SFIs are conducted in accordance with formal, NNSA-established protocols whenever a condition is found in a stockpiled weapon that does not meet the original weapon condition or design intent. Multi-disciplinary expert review teams begin by assessing the potential and immediate impacts of the identified condition. The results of this initial assessment determine the priority assigned to resolution of the SFI. Safety-related SFIs automatically receive top priority.

On average, LANL conducts about 500 surveillance tests per year on weapons drawn from all stockpiled systems. We expect to conduct 650 surveillance tests in FY 03. The number of weapons systems in the nuclear stockpile is the primary basis for selecting the level of surveillance activity; the number of individual weapons is a secondary consideration. Thus, surveillance activity is not projected to decline as a result of the Nuclear Posture Review and its goal to achieve significant reductions in the number of weapons in the nuclear stockpile.

The ratio of SFIs in LANL-designed systems to surveillance tests since the end of underground nuclear testing is 65:5000. At the current time, LANL has 30 open SFIs, ranging in age from 1 to 65 months; none of these are safety-related. LANL's average time to complete and close an SFI is 34 months, depending on the extent to which large-scale experiments such as hydrodynamic tests or detailed computer simulations are required.

SFI protocols provide a flexible, risk-based approach that assures immediate attention and highest priority for real or potential safety-related problems and provides that other SFIs will be prioritized with other ongoing SSP work. This approach assures the best use of available resources. Significant acceleration of the rate at which SFIs are completed and closed would require considerably increased funding, or significant reductions in funds currently devoted to other SSP work, or both. Absent specific evidence that the safety, reliability or expected performance of any stockpiled weapons system is in doubt, LANL would not advocate such acceleration.

Stockpile Life Extension Programs

Even in storage, nuclear weapons have dynamic properties that cause changes and deterioration of some parts and components over time. To address these changes and to assure continued safety and reliability, NNSA, the Department of Defense (DoD), and the Nuclear Weapons Council (NWC) have agreed on specific life extension programs for selected weapons systems.

Two LANL-designed systems – the B61 and the W76 – have been designated for life extension programs. Based on a process (Phase 6.X) that mimics the management framework for designing and building nuclear weapons and that was used by the DOE Office of Defense Programs (now NNSA/DP) for over 40 years, both systems will be refurbished.

B61 LEP

Refurbishment of the B61 Mods 7 and 11 canned subassemblies is scheduled to begin in 2006. A feasibility and cost study was authorized last year. Planning, risk assessment, scheduling and cost estimating are in progress at LANL; material tests are being performed at Y-12 and at Los Alamos. The Kansas City Plant will evaluate the manufacture of new components with substitute materials. The Certification Plan, Test and Evaluation Plan, and Weapon Design and Cost Report are scheduled to be released in July, 2002. The B61 LEP is on track to meet its scheduled commitments.

W76 LEP

Extension of W76 warhead life through 2042 has been established by the Department of the Navy. A comprehensive evaluation of the condition and life expectancy of the materials in the nuclear explosives package has been completed. Engineering development was begun last year and will continue through production development and certification. LANL's W76 LEP is on track to meet its scheduled commitments.

Manufacturing

In addition to its responsibility for the B61 and W76 LEPs, LANL contributes to the overall sustainment for all nuclear weapons via various manufacturing activities. These include manufacture of beryllium parts in the new Beryllium Technology Facility at LANL, which was qualified last year and is the only such capability in the country. LANL also makes tritium-loaded neutron sources for Sandia National Laboratories and supplies detonators to the Kansas City Plant. LANL also is responsible for producing joint test assemblies (mock pits for field test devices) as well as packaging and transportation materials for shipping explosives components. All manufacturing commitments have been met on time and to specification; we expect to continue this level of performance in FY 03.

The largest and highest priority manufacturing activity at LANL is pit manufacturing. LANL is on track to produce a certifiable pit for the W88 in 2003. "Certifiable" means that we can demonstrate that the pit has been fabricated according to design specifications, can be manufactured in a reproducible process, and that necessary quality systems are in place. Associated safety, security and technical requirements are demanding. Specific processes include materials purification and alloying, machining, welding, and inspection. While we have made every effort to duplicate what was done in the original manufacture of pits at Rocky Flats, changes in environmental requirements and other factors have necessitated some modifications. More than 40 separate processes have to be documented and individually qualified.

To date, LANL has produced 11 pits for engineering development and testing purposes. The production schedule for the remainder of the year will include 3 more pits, 19 hemi-shells for testing and analysis, 4 subcritical components, and many small parts for certification.

Pit manufacturing is a multi-purpose effort that is designed to: a) reestablish the capability to manufacture plutonium pits in limited (10 – 20/year) quantities; b) prototype processes and configurations for use in a modern pit facility; and c) produce replacement pits for those destructively tested in the annual surveillance of the W88 system.

Taken together, all manufacturing activities at Los Alamos make LANL the second largest production site in the NNSA complex.

Certification

LANL and Sandia National Laboratories jointly share the responsibility for continually assessing the safety and reliability of the nuclear weapons for which we are the joint design agencies. Annually, LANL and SNL issue annual assessment reports that summarize the Laboratories' knowledge about the health of our warheads. These reports, in conjunction with the annual assessment letters issued by the President of SNL, and myself to the Secretaries of Energy and Defense, constitute the formal evaluation of the safety and reliability of the nuclear weapons in the Nation's stockpile. This annual certification currently being accomplished without nuclear testing and represents one of the most technically challenging tasks ever assigned to the

Laboratories. Although there are no guarantees that certification without testing will always be possible, I am confident today that the warheads remain safe and reliable.

A second certification responsibility that applies uniquely to LANL is the requirement to certify pits manufactured here. Pit certification involves three types of certification activities:

- Production certification - assurance that the pits are made according to design specifications;
- Engineering certification - assurance that the pit will endure the "Stockpile-to-Target-Sequence environments" encountered during storage, handling and delivery; and
- Physics certification - assurance that the pit will produce the required yield to perform its mission.

Los Alamos has identified a series of Laboratory and subcritical experiments that are designed to provide the necessary data, within the limits of non-nuclear tests that will allow our technical experts to assert the pit will perform as required. We have also obtained NNSA approval of a baseline change that will allow the certification date to move forward from 2009 to 2007.

Weapon's Science and Technology

All of the foregoing accomplishments and potential for future achievements are attributable to and depend on the availability of a robust, continually advancing science and technology base. I am concerned that near-term and competing demands often appear to be more immediately urgent than new investments in science and technology and that the temptation to balance today's budgets by postponing such investments is often too great to resist. Three subjects are worth mentioning in particular:

- Advanced Simulation and Computing (ASC);
- Hydrodynamic Testing (DARHT); and
- Proton Radiography (LANSCE, AHF)

<u>Advanced Simulation and Computing (ASC)</u>

The ASC program is intended to provide via computation and simulation the types information previously obtained via underground nuclear testing – although it must be noted that ASC is not and is not intended to be a substitute to replace all testing. The objective of the program, which is a joint effort among the three NNSA laboratories, is to provide by FY 2005 validated 3-D, high-fidelity physics, full-system simulation codes required for engineering, safety and performance analysis of the stockpile.

At all three laboratories, we continue to make rapid advances in our ability to simulate nuclear explosions more quickly and with greatly increased detail. Earlier this year, LANL completed its first 3-D simulation of a full nuclear weapon system explosion. The calculation was run remotely from Los Alamos on the "White" machine at Livermore Laboratory. In about 4 months of around-the-clock computing, the simulation used more than 480 million cells on 1,920 of the White machine's 8,000+ processors. Actual time on the central processing unit was the equivalent to computing continuously on a high-end home computer for more than 750 years. This first-ever 3-D simulation represents significant advances in visualization techniques as well as in computing power.

The ultimate objective of the ASC program is a 100-teraflop machine which we believe is necessary to provide timely weapon system simulations for the weapons design community. The

next step beyond the White machine at Livermore is acquisition and installation of the 30-teraflop "Q" machine at LANL, which is currently underway.

Hydrodynamic Testing and DARHT

The most critical component of a nuclear weapon is the primary. Hydrodynamic tests – non-yield experiments that measure implosion characteristics — enable us to examine and more fully understand primary performance.

To date, one axis of the Dual Axis Radiographic Hydrodynamic Test (DARHT) facility has been completed and the 2nd axis is scheduled for completion at the end of calendar 02. Commissioning of the 2nd axis will take place during FY 03 and the full 2-axis capability will become available in FY 04. LANL has successfully operated by the first axis for experimental purposes while continuing construction on the 2nd axis, thus capitalizing on the initial investment of taxpayer dollars before the entire facility has been completed.

Using a single axis, DARHT has enabled us to image hydrodynamic tests with unprecedented resolution and clarity. The 2nd axis will enable stereoscopic and time-sequenced views of hydrodynamic experiments, which are vital to supporting life extension programs, W88 pit certification, and validation of new modeling tools for simulating weapons safety and reliability. We expect that DARHT will be the primary test facility for the Stockpile Stewardship Program for the coming decade.

Eventually, however, advanced radiography capabilities will be needed to address future challenges of stockpile stewardship and to train and qualify the next generation of weapons designers who will be the first generation required to certify the nuclear stockpile having had no direct nuclear test experience.

Proton Radiography, LANSCE, and AHF

In a no-test environment, high-fidelity radiographic motion pictures of hydrodynamic tests will be the next best means of understanding weapon performance. The most promising technology – developed by scientists at Los Alamos via the Laboratory Directed Research and Development (LDRD) program – is proton radiography.

Proton radiography is already an operational tool at the Los Alamos Neutron Science Center (LANSCE) and has been used to make quantitative measurements of high explosive and other weapon relevant material behavior under extreme dynamic conditions. The capability is used by weapon designers ***and*** by other research collaborators on a variety of science undertakings. Proton radiography has already provided data that has influenced stockpile decisions. Its availability supports and strengthens LANSCE as the Laboratory's flagship user research facility.

LANSCE just completed one of its most successful and productive running periods, operating with greater than 90 percent availability, 7 days/week, 24 hours/day. This rate of availability allowed LANSCE to support more than 200 experiments and over 300 users. In this respect, LANSCE is a key element in LANL's efforts to provide the intellectual capital that we will need over the next decade. By providing an exciting experimental tool to address basic science ***and*** stockpile issues, we are continuing to attract early-career scientists who bring fresh approaches to LANL's mission and related tasks. Historically, LANSCE has been the entry point for over 1000 of our scientific and technical personnel.

Advancing radiographic capabilities to accurately image hydrodynamic experiments with sufficient detail to address long-term certification and assessment requirements is critical. A high-resolution radiographic motion picture of a hydrodynamic test provides us with a means of understanding weapon implosions. Data obtained from these experiments will provide the strongest technical justification for determining nuclear weapon performance, short of a nuclear test. High-energy proton beams delivered with flexible time-sequencing (tens of pulses) will provide an unprecedented capability to directly image very thick complicated geometries of surrogate weapon configurations. The most promising technology for establishing this capability through the creation of an Advanced Hydrodynamic Facility (AHF) is based on high-energy protons. Current efforts are underway to evolve the technically essential tool of radiography based on the current x-ray facilities to an AHF based on protons. This work is essential to ensure that this critical prediction validation and precision design tool can be developed to maintain future nuclear-weapon expertise. An AHF designed to address design physics requirements in the 2015-2020 timeframe must be started soon. The Nation's investment in this area is both prudent and timely.

Threat Reduction and Homeland Security

For decades, the U.S. has invested in tools to respond to a nuclear accident or guard against a surreptitious nuclear weapon threat and has provided help to the International Atomic Energy Agency and other governments to safeguard and control nuclear materials. Since the early 1990s, we have helped secure vulnerable nuclear materials in Russia. Dating to the early 1980s, LANL has conducted research in biological sciences – research initially supported via LDRD funding – which led directly to our ability, post 9/11, to support deployment of the Biological Aerosol Sentry and Information System (BASIS) system, developed with Lawrence Livermore National Laboratory (LLNL), and to provide forensic expertise in analyzing anthrax samples. Obviously, these efforts have taken on new and urgent priority since September 11.

NNSA has unique expertise, resident at Los Alamos, Lawrence Livermore, and Sandia National Laboratories, in nuclear, chemical and biological technologies. That expertise has a long and successful history of supporting the intelligence community. In light of the new priorities and challenges following September 11, I believe that the NNSA laboratories can and should play a central role in providing the science and technology for countering the terrorist threat and protecting the U.S. and its allies against weapons of mass destruction. Three key near-term challenges are particularly suitable for NNSA laboratory attention:

- Preventing and responding to threats of nuclear terrorism;
- Detecting and countering biological weapons; and
- Analyzing and protecting the Nation's critical infrastructure.

Programs already are underway in all of these areas, including our work in biological research and in the National Infrastructure Security Analysis Center (NISAC), which we are conducting in cooperation with Sandia National Laboratories.

Tightly controlling nuclear and radioactive materials continues to be the key to preventing terrorists or rogue states from creating radioactive dispersal devices – so-called "dirty bombs" – or nuclear weapons. The demonstrated global reach of terrorists and states that sponsor terrorism and their interest in weapons of mass destruction call for enhanced protection and management of nuclear and radioactive material inventories.

The goal of a strong, integrated, NNSA-led program is a global web of protection that:

- Ensures nuclear and radioactive materials are protected from theft and misuse;
- Responds to thefts of materials and threats involving nuclear and radioactive materials;
- Interdicts illicit trafficking in nuclear and radioactive materials;
- Detects and responds to non-nuclear-weapon States' attempts to produce or acquire materials for nuclear weapons programs;
- Promotes responsible management of existing military and civilian nuclear and radioactive material inventories; and
- Provides international confidence in the global systems of protection and control.

We should seriously consider a specifically defined role for the NNSA and its laboratories as principal R&D support to reducing the threat and securing our homeland from terrorists and their potential to use weapons of mass destruction whether nuclear, chemical or biological, against us. A streamlined, integrated approach to funding and program development that would ensure needed state-of-the-art technologies and a longer-term R&D program to address future contingencies would contribute significantly to our ability to effectively counter terrorist threats.

Laboratory Directed Research and Development (LDRD)

The LDRD program enhances the scientific and technical capabilities of national laboratories to meet long-term science and technology needs of the nation. This means being able to explore new developments in all relevant areas of science quickly and develop ideas that eventually serve the policy objectives of the federal government. Throughout the history of the LDRD program the Laboratory has focused a significant portion of these resources on important scientific questions that underpin our nuclear weapons mission. LDRD investments have produced innovations essential to the ability of the laboratories to continue to accomplish our long-term programmatic missions. The program has a clear reputation for attracting high-caliber staff needed to meet the science and engineering challenges of stockpile stewardship, reducing the threat of weapons of mass destruction, homeland defense, and other missions. LDRD advances the frontiers of knowledge in scientific fields vital to the Laboratories' missions, future, and effectiveness in serving the Nation. Some examples of success and clear benefit follow.

In the absence of testing for nuclear weapons, more detailed knowledge is needed on nuclear and other key materials contained in weapons systems in order to better understand how they age. We recently invested in work exploring issues such as the interactions of a plutonium surface with its surrounding environment. Such studies help us understand what might happen as a weapon ages, and also inform us about better ways to store nuclear materials or even to clean up environmental legacies from the Cold War. In addition, we have identified opportunities for additional research on nuclear materials and their properties, based on novel experimental approaches and new capabilities in materials modeling. The investment in these research topics does and will have direct impact on our ability to perform our mission.

In the area of countering the proliferation of weapons of mass destruction (WMD), the Nation faces potentially devastating new weapons systems based on chemical or biological weapons. LANL is seeking ways to detect the development or use of such weapons. Several new ideas have been proposed and funded to explore fundamental science and technology needed to combat the development and use of WMD. For example, researchers are exploring the fundamental mechanisms that produce virulence in pathogens. Understanding these mechanisms should enable us to design new sensors for rapid and early detection of the use of biological weapons.

Facilities and Infrastructure Initiative

The entire nuclear weapons complex managed by the DOE/NNSA—the production plants and laboratories—is faced with serious aging problems that threaten our ability to carry out the stockpile stewardship mission. To continue to work effectively on these DOE/NNSA missions, our Laboratory needs outstanding scientists and engineers working in state-of-the art facilities. Our facilities have deteriorated badly—buildings, roads, sewer systems; electrical power grid and other critical infrastructure are approaching fifty years old and are crumbling at an alarming rate. A dedicated and enduring revitalization effort is crucial for the long-term viability of this Laboratory and the weapons complex as a whole.

We believe that there are three distinct areas that must be addressed in order to ensure infrastructure sustainability to meet our mission. Those three areas include: implementing formal facilities consolidation efforts and cost reduction initiatives; addressing high-priority facility maintenance backlogs; and investing in new construction projects, where appropriate and economically feasible. Each of these areas requires commitments to achieve positive results. Each area addresses safety and security needs and allows Laboratory facilities to be sustainable over the next 20 to 40 years.

Ten or more years ago, the long-term outlook for the nuclear weapons complex and budget was uncertain, but the requirement to ensure the safety and reliability of the Nation's nuclear deterrent remains. During this period, Los Alamos and much of the rest of the nuclear weapons complex sacrificed continual reinvestment for the future in favor of short-term operational needs. With existing operating funds, we have been able to complete some urgent maintenance at our aging facilities, but this only scratches the surface. Only the utmost top-priority issues have been addressed, while the backlog of unfunded maintenance continues to grow as facilities age. The demands placed on the safety and security infrastructure from increased regulation and oversight have also stressed our resources. We are still running many buildings to failure.

We strongly support General Gordon’s 10-year Facilities and Infrastructure Revitalization Initiative. Congress provided an initial down payment last year, but continued support is critical in FY03 and beyond. Without continuing and strong support of this initiative, we will not be able to carry out either the manufacturing or certification efforts for the stockpile. Furthermore, we request your strong support for General Gordon’s Five Year Defense Plan for NNSA at a level that can support the growing requirements and need for development of new tools and experimental facilities for certification of an aging stockpile.